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10/533,091

04/28/2005

Hideya Kumomi

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EXAMINER

ROMAN, ANGEL

ART UNIT

PAPER NUMBER

2812

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DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/533,091

Applicant(s)

KUMOMI ET AL.

Examiner

Angel Roman Jr.

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) 10-30 and 46-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 31-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 04/28/05, 08/30/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election of Specie I, claims 1-9 and 31-45 in the reply filed on 07/13/07 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

### ***Information Disclosure Statement***

2. The references cited in the information disclosure statements filed 04/28/05 and 08/30/06 have been considered by the examiner.

### ***Specification***

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claims 2 and 3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. The term "irregularity" in claims 2 and 3 is a relative term, which renders the claim indefinite. The term "irregularity" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The term irregularity is not defined or describe by the specification or claims therefore the record is unclear regarding how the irregularity is formed and what it constitute. For examination purposes the examiner would interpret irregularity as a general feature on a substrate.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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8. Claims 1-4, 31-34, 38-41 and 43-45 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayafuji et al., US 4,564,403 dated 01/14/1986.

Regarding claim 1, Hayafuji et al. discloses a method for producing a crystalline film by melting and resolidifying a film (106) comprising the steps of: preparing a film having a specific region obtained either by a step of forming a film in which a "specific region" and an "region continuous to a periphery of the specific region and different in thickness from the specific region" co-exist, melting at least a part of the film and resolidifying the film (see figures 29-31 and associated disclosure in columns 7 and 8).

Regarding claim 2, Hayafuji et al. discloses includes a step of forming an irregularity (204) on a surface of the film (see figures 29-31).

Regarding claim 3, Hayafuji et al. discloses a step of forming an irregularity (204) on a surface of a substrate on which the film is provided.

Regarding claim 4, Hayafuji et al. discloses a step of forming a film (106) in which the specific region has a thickness larger than in the peripheral region thereof (see figures 29-31).

Regarding claim 31, Hayafuji et al. discloses a spatial position of at least a part of crystal grains having a continuous crystalline structure in the crystalline film is determined by a spatial position of the specific region (see Abstract).

Regarding claim 32, Hayafuji et al. discloses element utilizing a crystalline film obtained by a producing method according to claim 1, wherein a spatial position of at least a part of crystal grains having a continuous crystalline structure in the crystalline film is determined by a spatial position of the specific region, and a crystal grain having the determined spatial position is utilized as an active area (see Abstract).

Regarding claim 33, Hayafuji et al. discloses using the crystalline substrate to form single crystal devices, therefore implicitly disclosing forming an active area inside a single crystal grain of the crystalline film (see column 1, lines 6-10 and figures 35-38).

Regarding claim 34, Hayafuji et al. discloses using the crystalline substrate to form single crystal devices, therefore implicitly disclosing a circuit including a plurality of the elements, and a wiring between the elements (see column 1, lines 6-10 and figures 35-38).

Regarding claim 35, Hayafuji et al. discloses similar specific regions and melting resolidification process as claimed by Applicants therefore, by defining a melting point of a bulk crystal as  $T_c$  and a supercooling degree causing a spontaneous nucleation from

a molten phase as  $\Delta T_c$  in a melting-resolidification process of the film, the specific regions are provided with such an interval that a portion positioned between the specific regions of the predetermined interval reaches a temperature equal to or higher than  $T_c - \Delta T_c$  at a time when an unsolidified region reaches a supercooling degree of  $\Delta T_c$  at the resolidification of the film.

Regarding claim 36, Hayafuji et al. discloses similar specific regions and melting resolidification process as claimed by Applicants therefore the specific regions are provided with such an interval that a portion where a region, in the vicinity of a growth front of a crystal grain growing from a specific region and having a higher temperature than in a periphery, overlaps with a region, in the vicinity of a growth front of a crystal grain growing from another specific region and having a higher temperature than in a periphery, has a temperature equal to or higher than  $T_c - \Delta T_c$ .

Regarding claim 37, Hayafuji et al. discloses similar specific regions and melting resolidification process as claimed by Applicants therefore the specific regions are provided with such an interval that growth fronts of crystal grains growing from two specific regions mutually contact before a time when a portion where a high-temperature region, in the vicinity of a growth front of a crystal grain growing from a specific region, overlaps with a high-temperature region, in the vicinity of a growth front of a crystal grain growing from another specific region, reaches a temperature equal to or lower than  $T_c - \Delta T_c$ .

Regarding claim 38, Hayafuji et al. discloses a melting-resolidification process of a film, in melting the film with plural heating means (160A-F) and resolidifying the film (see figures 12-15).

Regarding claim 39, Hayafuji et al. discloses at least one of the plural heating means is heating means (160) having a constant heating intensity without a change with time, in a melting process of the film (see columns 5 and 6).

Regarding claim 40, Hayafuji et al. discloses the heating means having a constant heating intensity being a heat conduction from a substrate, an irradiation with a continuously oscillated laser light, or a current-supply heating of the film (see figures 12-15).

Regarding claim 41, Hayafuji et al. discloses at least one of the plural heating means being heating means having a heating intensity changing with time, in a melting process of the film (see figure 12).

Regarding claim 43, Hayafuji et al. discloses the plural heating means includes heating means having a constant heating intensity without a change with time in a melting process of the film, and heating means having a heating intensity changing with time in a melting process of the film (see figures 12-15).



Regarding claim 44, Hayafuji et al. discloses the plural heating means including heating means which heats the film to a temperature not exceeding a melting point, and heating means for heating the temperature-elevated film thereby melting the film (see figures 12-15).

Regarding claim 45, Hayafuji et al. discloses a step of giving a heat not changing with time to the film thereby heating the film to a temperature not exceeding a melting point, a step of giving a heat changing with time thereby heating and melting the temperature-elevated film, and a step of resolidifying the film (see columns 5 and 6).

9. Claims 1-5 and 31-34 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheng et al. US 6,432,758 B1 filed 02/13/2001.

Regarding claim 1, Cheng et al. discloses a method for producing a crystalline film by melting and resolidifying a film (204) comprising the steps of: preparing a film having a specific region obtained either by a step of forming a film in which a "specific region" and an "region continuous to a periphery of the specific region and different in thickness from the specific region" co-exist, melting at least a part of the film and resolidifying the film (see Abstract).

Regarding claim 2, Cheng et al. discloses includes a step of forming an irregularity (207') on a surface of the film (see figure 5).

Regarding claim 3, Cheng et al. discloses a step of forming an irregularity (202) on a surface of a substrate on which the film is provided.

Regarding claim 4, Cheng et al. discloses a step of forming a film (204) in which the specific region (206) has a thickness larger than in the peripheral region (205) thereof (see figure 5).

Regarding claim 5, Cheng et al. discloses, at a maximum melting state of the film in the melting-resolidification process, a single crystal grain or single crystalline cluster remains unmelted in the specific region while the peripheral region thereof is completely melted (see Abstract).

Regarding claim 31, Cheng et al. discloses a spatial position of at least a part of crystal grains having a continuous crystalline structure in the crystalline film is determined by a spatial position of the specific region (see Abstract).

Regarding claim 32, Cheng et al. discloses element utilizing a crystalline film obtained by a producing method according to claim 1, wherein a spatial position of at least a part of crystal grains having a continuous crystalline structure in the crystalline film is determined by a spatial position of the specific region, and a crystal grain having the determined spatial position is utilized as an active area (see Abstract).

Regarding claim 33, Cheng et al. discloses using the crystalline substrate to form single crystal devices and forming an active area inside a single crystal grain of the crystalline film (see figure 7).

Regarding claim 34, Cheng et al. discloses using the crystalline substrate to form single crystal devices, and disclosing a circuit including a plurality of the elements, and a wiring between the elements (see figure 7).

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

13. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. US 6,432,758 B1 filed 02/13/2001.

Cheng et al. is applied as above but lacks anticipation in comparing a thickness dimension to a crystal growth rate by describing that a ratio of a dimension to a thickness of the specific region is larger, when a crystal growth of the single crystal grain or the single crystalline cluster existing in the specific region executes a crystal growth in a resolidification step, than a ratio of a growth velocity in a planar direction to a growth velocity in a direction of film thickness in the specific region; a ratio of a dimension to a thickness of the specific region is, when a crystal growth of the single crystal grain or the single crystalline cluster existing in the specific region executes a crystal growth in a resolidification step, within such a range that a growth front in a direction of film thickness reaches a surface of the film before a growth front in a planar direction of the film reaches a periphery of the specific region; a ratio of a dimension of the specific region to a thickness difference between the specific region and the

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periphery region is larger, when a crystal growth of the single crystal grain or single crystalline cluster existing in the specific region executes a crystal growth in a resolidification step, than a ratio of a growth velocity in a planar direction to a growth velocity in a direction of film thickness in the specific region; or a ratio of a dimension of the specific region to a thickness difference between the specific region and the periphery region is larger, when a crystal growth of the single crystal grain or the single crystalline cluster existing in the specific region executes a crystal growth in a resolidification step, within such a range that a growth front in a direction of film thickness reaches a surface of the film before a growth front in a planar direction of the film reaches a periphery of the specific region. It would have been obvious to a person having ordinary skills in the art at the time the invention was made to describe a relationship between a thickness dimension to a crystal growth rate as stated above, in the primary reference of Cheng et al. since the method and physical characteristics of the crystallization process describe in Cheng et al. would provide similar results and in order to better describe the process by establishing a physical relationship between described elements.

14. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayafuji et al., US 4,564,403 dated 01/14/1986.

Regarding claim 42, Hayafuji et al. is applied as above and further discloses using heat sources that change with time (see column 5, lines 15-23) but lacks

anticipation on using a pulsed laser for irradiating the film with two pulses of different intensities with a time difference. It would have been obvious to a person having ordinary skills in the art at the time the invention was made to use a pulsed laser for irradiating the film with two pulses of different intensities with a time difference as the heat source in the primary reference of Hayafuji et al. in order to provide enough energy for the melting resolidification process and since Hayafuji et al. already discloses using a time variable heat source, selecting a pulsed laser is only considered routine optimization of the process already disclosed by Hayafuji et al.

### ***Conclusion***

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hatano et al., and Nishimura et al. disclose methods for producing crystalline films by melting and resolidifying films having thickness variations.


16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angel Roman Jr. whose telephone number is (571) 272-6369. The examiner can normally be reached on IFP Mo-Fr 6am-3pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AR  
September 22, 2007



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SUPERVISORY PATENT EXAMINER